

Genus SPIRORBIS, Daud.

Spirorbis borealis, Daud. ; Mgrn. *op. cit.* p. 122.

Abundant on seaweeds and stones between tide-marks.

Spirorbis lucidus, Mont. ; Mgrn. *op. cit.* p. 123.

Common on zoophytes from deep water.

[To be continued.]

XXIX.—*Descriptions and Figures of Deep-sea Sponges and their Spicules from the Atlantic Ocean, dredged up on board H.M.S. 'Porcupine,' chiefly in 1869; with Figures and Descriptions of some remarkable Spicules from the Agulhas Shoal and Colon.* By H. J. CARTER, F.R.S. &c.

[Plates XIII., XIV., & XV.]

I NOW propose to describe and illustrate for publication a few more of the deep-sea sponges dredged up on board H.M.S. 'Porcupine,' from the bed of the Atlantic Ocean, off the coast of Ireland, or between the north of Scotland and the Faroe Islands—every fragment of which that came into my hands was immediately sketched and preliminarily recorded in my MS. journal, with all the information as regards "soundings &c." that accompanied them, in order that I might possess the means of referring to any particular specimen directly, and, in case of accident, thus endeavour to provide against total loss.

The greater part of these specimens represent sponges which have already been described; and the rest will be considerably reduced by those which I am now about to add. Among the latter, however, will be found such extraordinary forms of the flesh-spicule that, unless I first describe a well-known one for reference, they will probably not be understood.

As regards nomenclature, it is not desirable to give new names if we wish to *speed* knowledge; and hence it is better, if possible, to retain an old one, although inappropriate, rather than oppress the mind at the outset by introducing that to which it is unaccustomed. Much that is valuable is never read because it is accompanied by new names.

Again, if we can find familiar types in our British sponges for reference, when engaged in the study of foreign species, it is better to adopt these than to refer to specimens which are less accessible.

Thus, in the present instance, I shall have recourse to Johnston's *Halichondria incrustans*, whose description, including Col. Montagu's observations (Johnst. Brit. Sponges, 1842, p. 122, pl. xi. fig. 3, and pl. xii. fig. 3), leaves no doubt in my mind that the species grows plentifully about this place (Budleigh-Salterton, Devon); while Johnston's figures of *H. incrustans* and *H. saburata*, together with his specimens now in the Johnstonian Collection of the British Museum, have led me, as well as Dr. Bowerbank (B. S. vol. ii. p. 248) to the conclusion that they all represent one and the same sponge, viz. *Halichondria incrustans*.

The reason that I have not yet published descriptions of more of the sponges that were dredged up on board H.M.S. 'Porcupine,' which were handed over to me for this purpose, is that the system under which I have arranged the collection of sponges in the British Museum is not yet sufficiently matured for publication; and until I have this for reference, there is no other arrangement of the sponges that appears to me to offer any thing so practicable. "Why then," it may be asked, "do you still publish descriptions of these specimens?" My reply is, that "the examination and arrangement of the collection of sponges in the British Museum has already taken up so much time that it seems to me better that I should at once do a little more to the deep-sea ones, and thus partly anticipate my arrangement, than leave them all for description until this is completed."

Returning, then, to *Halichondria incrustans*, it will be remembered by those acquainted with the elements of this sponge that one of the minute or "flesh-spicules" is an anchorate, somewhat like that illustrated in my last communication to the 'Annals' (vol. xiv. p. 105, pl. x. fig. 12); and before proceeding to the description and illustration of the deep-sea sponges, it is desirable that I should notice this spicule in detail in *H. incrustans*, which, perhaps, affords the best typical form of it that can be obtained for this purpose, at the same time that the sponge producing it is common on our shores.

The term "anchorate," first used by Dr. Bowerbank (*Haken*, Schmidt), answers very well generically; but as one end of this spicule is occasionally much more developed than the other, Dr. Bowerbank has found it necessary to add the specific terms "equianchorate" and "inequianchorate," which, respectively, are equally appropriate.

It is the "equianchorate" form, as it exists in *Halichondria incrustans*, that, being the most typical of the two, I am now about to describe *in detail*, in order that the same kind of flesh-spicule, which will hereafter be found to be so extraordinarily

modified in form in the deep-sea sponges, may be understood.

The equianchorate, then, of *Halichondria incrustans* consists of a shaft and three arms or hooks of equal size at each end, whence its specific designation (Plate XIII. fig. 1, *a, b, c*). The shaft is curved bow-like equally (fig. 1, *a, d*), and the three arms recurved towards the concavity of the shaft (fig. 1, *b, e, f*). Two of these arms are lateral (fig. 1, *b, f*), and the other anterior or in front (fig. 1, *b e, a e*); hence the back of the shaft forms a continuous and uninterrupted curve (fig. 1, *d*). All three of these arms are attached to the shaft by falciform expansions, extending between the shaft and the arms respectively (fig. 1, *a g, c h*), which expansions will be termed in the singular number the "falx," and in the plural "falces;" and while the two lateral arms, being opposite to each other, thus present a wing-like appearance (fig. 1, *c h*), the anterior one being single, median, and in front, presents a linear form; but in all the falx is more or less retracted and web-like towards the end of the shaft (fig. 1, *a g*).

As the anterior arm of the anchorate in other sponges frequently presents a petaloid or tongue-shaped form of extreme thinness, while the linear element, when it remains in this form, represents the midrib of a leaf, but as often is retracted into an elliptical or circular body, which, at the base of the petaloid expansion, is joined through the intervention of the falx to the shaft, we shall call this the "tubercle" (fig. 1, *b i*, and fig. 4, *e*).

Thus we have to remember the "shaft," the "lateral" and "anterior arms" respectively, the "falx," and the "tubercle" for this complicated little spicule.

I should also here add that, in the anchorate of *Halichondria incrustans*, there are four lateral convex aliform expansions of the shaft itself, viz. one on each side towards the ends, thus causing the shaft to present a constricted form in the centre when viewed anteriorly or posteriorly (fig. 1, *b & c*). These aliform expansions will also be seen, by-and-by, in the anchorate of *Chondrocladia virgata* and other deep-sea sponges.

In my last communication to the 'Annals' (*l. c.*) it will be observed that I have figured three forms of flesh-spicules as common to *Halichondria egagropila*, Johnston (*Esperia egagropila*, Carter); and it will also be found that the two additional ones (viz. the "tricurvate" and the "bihamate") are as frequent in their occurrence in many other sponges as the "anchorate" itself, but, being very simple in construction, they do not require a detailed description like the anchorate. In the communication to which I have just alluded it will further be

seen that the anchorate presents the form specifically termed "inequianchorate," and thus affords, with that under description, the two principal varieties, viz. the "equi-" and "inequi-" anchorates respectively of this spicule.

Halichondria incrustans differs from *Esperia* (Carter) in possessing two forms of skeleton-spicules, viz. an acuate or club-shaped spicule, spined or not, and an acerate (smooth, curved, fusiform, and pointed at each end), sometimes inflated round, hastate, or even minutely spined, at the ends; while *Esperia* only possesses one form of skeleton-spicule, viz. smooth, sub-pinlike, fusiform, with the body frequently thicker than the head, which is the reverse of the acuate in *H. incrustans*. The anchorate among the flesh-spicules, too, in *H. incrustans* is equi-ended (equianchorate), while in *Esperia* it is for the most part inequi-ended (inequianchorate).

I shall retain the term "*Halichondria*" for the group of sponges whose type is that of *H. incrustans* and its modifications, as it is necessary to adopt one for this purpose, and this, which appears to have been first introduced by Fleming in 1828 (*Hist. Brit. Animals*, p. 520), has since been most generally used.

With this short introduction, let us proceed to the description of the deep-sea sponges, which respectively will appear under the names:—*Guitarra fimbriata*, n. gen. et sp.; *Melonanchora elliptica*, n. gen. et sp.; *Esperia villosa*, n. gen. et sp.; *Esperia cupressiformis*, n. gen. et sp.; *Chondrocladia virgata*, Wyv. Thomson; *Histoderma appendiculatum*, n. gen. et sp.; *Halichondria abyssi*, n. gen. et sp.; *Halichondria forcipis*, Bk.; *Cliona abyssorum*, n. gen. et sp.; *Desmacella pumilio*, Schmidt; *Reniera fibulata*, Sdt.; and *Dictyocylindrus anchorata*, n. gen. et sp.,—to which will be added descriptions and figures of three remarkable spicules obtained from arenaceous deposits, respectively dredged up on the Agulhas Shoal, Cape of Good Hope, by Dr. G. C. Wallich, in 1857, and obtained just now by Mr. F. Kitton from Colon, Panama; to the former of which the name *Gummina Wallichii*, and to the two latter respectively *Forcepia colonensis* and *Corticium Kittonii*, will be given.

Guitarra fimbriata, n. gen. et sp. Pl. XIII. figs. 2-5, and Pl. XV. fig. 34.

General form conical (figs. 2 & 3); surface villous, even; villi formed by the projecting ends of the skeleton-spicules, arranged in tufts close together (fig. 3, *d*), and somewhat spirally over the body, lengthened into a tubular fringe around the apex (fig. 3, *a*). Sessile. Colour grey. Vent chiefly

apical (fig. 3, *a*), where it is surrounded by the fringe of long spicules just mentioned, while smaller vents (fig. 3, *c*) are scattered over the surface generally. Pores not seen. Internal structure massive, permeated by the excretory system of canals, which has its chief vent at the apex; charged with skeleton- and flesh-spicules, and surrounded by a cortical layer chiefly composed of the former, whose projecting ends give the villous surface (fig. 3, *d*).

Spicules of two kinds, viz. skeleton- and flesh-spicules. Form of skeleton-spicule, of which there is only one, smooth, acerate, fusiform, finely pointed, and nearly straight; average largest size 27 by $\frac{1}{2}$ -1800th of an inch in its greatest diameters (Pl. XV. fig. 34), that of the fringe round the apex much longer, viz. 1-24th inch. Flesh-spicule equianchorate, in which the lateral arms are so blended with the shaft as to convert the whole into a flattened plate, of an hourglass- or guitar-shape, constricted in the centre and round at the ends (Pl. XIII. fig. 4, *a b c*), bordered inside throughout by a fringe directed inwards towards the shaft (fig. 4, *d*), leaving a trapezoidal, clear area opposite the constriction, and a narrow, obovate one at each end (fig. 4, *b c*): anterior arm at each end flat, expanded into a circular or obtuse, thin, elliptical plate, presenting the same kind of fringe round its margin, directed inwards, and leaving, as in the shaft, a transparent ovate area in the centre (fig. 4, *b*); anterior arm equal in width to the end of the shaft &c., to which it is parallel transversely, but longitudinally inclined from it at an acute angle beginning at the end (fig. 4, *a*), where it is united to the shaft by a short falx (fig. 4, *f*), opposite to which is a large, clear, circular tubercle (fig. 4, *e*): average length of largest form 16-6000ths inch; widest part 6-6000ths; constricted part 3-6000ths. Size of entire specimen about 6 by 4-12ths of an inch in its largest diameters. Fringe of spicules round the apex 1-24th inch broad.

Hab. Deep sea.

Loc. Atlantic Ocean, off the N.W. coasts of the British Isles.

Obs. The jar containing this, with a specimen of *Podospongia Lovenii*, Bocage, one of *Desmacella pumilio*, Schmidt, and a fragment of an Hexactinellid sponge (*Askonema*?) bears no label. It is remarkable for the form of the anchorate spicule, which, but for reference to that of *Halichondria incrustans*, above given, is so modified in form that it could hardly be otherwise understood. Although the average largest size of this spicule is figured, it is present of all intermediate sizes down to an embryonic form not more than 2-5000ths inch long, in which the outlines alone of the hourglass-shape can be distin-

guished (fig. 5). Further, it is remarkable for having only *one* form of skeleton-spicule, and that acerate, and only one form of flesh-spicule, which, so far as is known, is unique; also for the length of the skeleton-spicules at the apex of the body, where they present a tubular fringe round an apical vent, like that seen in some of the Calcispongiæ, ex. gr. *Grantia ciliata* &c. I think, from the villous even surface and general composition of this sponge, it might be necessary to place it among the Suberites, in which case it would come into my 5th division, viz. RAYNERIÆ.

Melonanchora elliptica, n. gen. et sp. Pl. XIII. figs. 6-12, and Pl. XV. fig. 35, *a, b*.

General form globular, corrugated, studded with projecting tubercles over the upper two thirds, smooth below this, where it partly encloses a small stone (figs. 6 & 7, *b b*). Free. Colour grey. Composed of a stiff, glistening, bladder-like dermis, enclosing a soft fibreless parenchyma. Dermis formed of a wove-like texture, composed of linear spicules, intercrossing each other on the same plane, and held together by tough horny sarcode (fig. 8, *a*), corrugated, and presenting rounded tubercles (figs. 6 & 7, *aa*), whose heads respectively are cribriform (fig. 8). Pores and vents respectively situated in the cribriform tubercles (fig. 8). Internal structure massive, fibreless, permeated by the excretory canal-systems, which have their vents respectively in the tubercles; charged with skeleton- and flesh-spicules, together with ova sufficiently large to be seen with the unassisted eye. Spicules of two kinds, viz. skeleton- and flesh-spicules. Skeleton-spicules of two forms, viz. :—one, the largest, which is chiefly confined to the parenchyma, smooth, acute, curved, and abruptly pointed, averaging, in its largest size, 53 by 1-1800th inch in its greatest diameters (Pl. XV. fig. 35, *b*); and the other, which is the smallest, and chiefly confined to the dermal texture, smooth, slightly curved, fusiform, and inflated at the ends, averaging, in its largest size, 35 by 1-1800th of an inch in its greatest diameters (fig. 35, *a*). Flesh-spicule of one form only, viz. equianchorate (Pl. XIII. fig. 9), in which the three arms, growing towards each other (fig. 11), at length unite, and, with the shaft, ultimately form two ellipses, which, cutting each other longitudinally and at right angles (fig. 10), give a melon-shaped appearance to the anchorate (fig. 9), which, but for the gradation of all its stages of development being present, from the simple embryonic *equianchorate* form (fig. 12, *a b*), like that of *Halichondria incrustans*, to the fully developed melon-shaped one, would hardly have been thought to have

come from an ordinary form of the anchorate. Arms, as they approach each other, becoming compressed, widened, and knife-shaped, with the thin edge inwards, and presenting, in their fully developed state, fine parallel striæ close together on the blade, which are perpendicular to its curved outer margin (fig. 9, *b*); also presenting, before the union of the arms is completed, a notch on the inner edge (fig. 9, *a*), which is filled up at maturity, at which time the shaft becomes undistinguishable from the arms: average largest size of melon-shaped form 12 by 7-6000ths of an inch in its greatest diameters (fig. 9); that of the embryonic form 6-6000ths inch long (fig. 12). Size of entire specimen about $1\frac{1}{4}$ inch in diameter in all directions; that of the tubercle about 1 to 2-6000ths inch in diameter.

Hab. Deep sea.

Loc. Atlantic Ocean, between the north coast of Scotland and the Faroe Islands.

Obs. This specimen is alone; and the label on the jar only bears "Porcupine, 1869," which refers to the "voyage." It is remarkable for the form of the full-grown anchorate, which here also, but for the presence of all minor grades of development leading up to the matured one, could hardly have been understood. It is further remarkable for the general form and structure of the body, although the presence of a stiff, bladder-like envelope or dermis, similarly composed and filled with a soft, parenchymatous, fibreless mass does not, as we shall see hereafter in *Histoderma appendiculatum*, appear to be so much confined to any particular species as to be a peculiarity of some of the deep-sea sponges. It had grown on, and subsequently partly round, the pebble at its base (Pl. XIII. figs. 6 & 7, *b b*), which, in the otherwise unattached state of the sponge, must at once have served to keep it more or less stationary, with the same side always uppermost. Hence, probably, the restricted position of the pore-areæ.

The alliance of the double form of skeleton-spicules here, as well as their shape respectively, with those of *Halichondria incrustans*, would seem to indicate that this sponge should be placed under the heading "*Halichondriæ*" in my 5th division of sponges, viz. RAYNERIÆ.

Esperia villosa, n. gen. et sp. Pl. XIII. figs. 13-15, and
Pl. XV. fig. 36.

General form massive, lobular, erect (fig. 13), growing from a contracted portion of stout, naked fibre (fig. 13, *a*), whose main filaments, being expanded at the ends, appear to have been torn

from some submarine object to which the sponge was thus attached. Sessile. Colour grey. Dermal surface villous, even, consisting of the ends of linear spicules that project in small tufts a little beyond the sarcode, which thus holds them in position (fig. 13, *b*). Pores in the interstices between the tufts (fig. 13, *c*). Vents scattered here and there irregularly. Internal structure parenchymatous and fibrous, surrounded by a spicular crust, which forms the villous surface (fig. 13, *b*), charged with spicules, and permeated by the excretory canal-systems, which respectively end in the vents mentioned. Parenchyma hung on the fibrous structure, which is stout, stiff, reticulate, anastomosing, and chiefly composed of the skeleton-spicules, united together by a small portion of horny sarcode. Spicules of two kinds, viz. skeleton- and flesh-spicules. Skeleton-spicule of one form only, viz. sub-pinlike, stout, smooth, slightly curved, abruptly pointed, head less in diameter than the shaft; average largest size 43 by $\frac{1}{3}$ -1800th inch in its greatest diameters (Pl. XV. fig. 36). Flesh-spicules of two forms, viz. bihamate and equianchorate. Bihamate very large, C-shaped, in which the central canal is visible (Pl. XIII. fig. 15, *a*), more or less contorted and sigmoid; average largest size 40 by $2\frac{1}{2}$ -6000ths inch in its greatest diameters (fig. 15). Equianchorate very long and narrow (fig. 14, *a*); anterior arm spatuloid, terminated at the fixed end by a short, elliptical tubercle, and attached by an equally short falx to the shaft; the free end, *en profile*, curved forwards and inwards, claw-like (fig. 14, *b*); lateral arms united to the shaft throughout by their falces respectively, and so long as to leave nothing of the shaft visible beyond a constricted portion in the centre (fig. 14, *e*), thus contrasting strongly with the half-grown individual (fig. 14, *c*); average largest size 24 by 3-6000ths inch in its greatest diameters; distance of the free end of the anterior arm from the shaft, when viewed laterally, greater than its width. Size of entire specimen $2\frac{1}{2}$ inches high by $1\frac{1}{4} \times 1$.

Hab. Deep sea.

Loc. Atlantic Ocean, between the north coast of Scotland and the Faroe Islands.

Obs. The No. on this jar is "51," whose "station" (for that is what the No. refers to in the "Reports") would give a depth of 440 fathoms. It is in company with *Hymedesmia Johnsoni*, Bowerbank (B. S. vol. i. p. 276), and *Axinella mastophora*, Schmidt. The specimen is very much injured; but enough of it remains to enable me to give the above description and figure in the plate. It is remarkable for the large size of the bihamate (fig. 15) and this particular weaver's-shuttle-like or navicular form of anchorate, which is by far the largest I have

yet seen (fig. 14). The bihamate presents the central canal; and the equianchorate differs so much in form between the half- and fully-developed states (fig. 14, *c* & *ab*), that, but for such gradations, they would hardly be recognized as belonging to each other. In the half-grown and embryonic form (fig. 14, *cd*) the shaft is much less covered in the middle, and the arms much wider than in the matured form, where the shaft is hardly seen from the close approach of the lateral arms to each other; while all the arms in the matured form appear to be more curved inwards than in the half-grown specimen, where their *expanded* state chiefly leads to their appearing to be so much wider. But for there being only one kind of skeleton-spicule, and this in singleness and form being evidently allied to *Esperia*, the presence of the anchorate in an equi-ended form would have led me to reject it from the *Esperiadæ* (Carter), whose most prevalent character is the *inequianchorate*; while the villous condition of the dermis, arising from the projecting ends of the skeleton-spicules, equally differs from the beautiful, subhexagonal, or polygonal, structure presented by the surface of *Esperia agagropila* and the like, in which the spicules do not project, but are on a level with the dermal sarcodæ. The naked, stiff, rigid, coarse, reticulate fibre at the base, composed almost entirely of spicules, is very characteristic of *Esperia*, whose parenchyma appears to leave and return to the old spiculo-fibrous structure as required; or, at all events, the latter when once produced is more durable than the parenchyma, which often, in the newly formed state, returns to and partly overspreads an old skeleton. Hence with the *Esperiadæ* a naked portion of this peculiarly rigid spiculous fibre is as common as it is characteristic.

Esperia cupressiformis, n. gen. et sp. Pl. XIV. figs. 16-19, and Pl. XV. fig. 37.

General form long, narrow, pyramidal, echinated all round with short, linear processes, diminishing in length, becoming thicker as they are inclined upwards towards the summit, and disappearing altogether towards the base, which is somewhat inflated (Pl. XIV. fig. 16). Matured form club-shaped. Processes at first pointed, and afterwards inflated at the ends respectively, becoming more or less united together by a continuous dermal layer of sarcodæ (fig. 16, *g*). Free or fixed. Colour whitish grey. (Or, in another form (fig. 19), capitate, head pyriform, compressed (fig. 19, *b*), supported on a slender stem, terminating in an expanded discoid root at the base (fig. 19, *c*.) Hispid over the lower half of the compressed head, and also over the root at the base (fig. 19, *c*). Capitate portion

divided into two lip-like parts, halfway down from the summit, parallel with the compression (fig. 19, *a*.) Dermal surface even, consisting of sarcode densely charged with minute inequianchorates, whose large ends just project above the level of the structure in which they are otherwise imbedded (fig. 16, *f*). Pores not seen, but probably in the dermal sarcode. Vents not seen. Internal structure dense, consisting of bundles of long linear spicules, partly erect and parallel and partly transverse, the former supplying the axial support of the body of the sponge, and the latter that of the echinating processes (fig. 16, *f*). Spicules of two kinds, viz. skeleton- and flesh-spicules. Skeleton-spicule of one form only, viz. long, smooth, acute or sub-pin-like, fusiform; average largest size 65 by 1-1800th of an inch in its greatest diameters; head narrower than the shaft (Pl. XV. fig. 37). Flesh-spicules of two forms, viz. inequianchorate and tricurvate. Inequianchorate (Pl. XIV. fig. 17 *a, b*) almost without appearance of shaft in the front view, as the lateral arms of the larger end reach down to those of the smaller one (fig. 17, *b*); anterior arm petaloid, much shorter than the lateral ones (fig. 17, *b*), presenting an elliptical tubercle where it is united to the end of the shaft by the falx, which is extended halfway down the petaloid arm; lower end of spicule much aborted; shaft much curved: average largest size $5\frac{1}{2}$ by 3-6000ths of an inch in its greatest diameters. Tricurvate (fig. 18), smooth, in the form of a minute hair-pin or pair of forceps—that is, as it were, consisting of a smooth, linear spicule, bent into a very acute angle, with attenuated arms, here terminated respectively by a bulbous inflation (fig. 18, *a*); round at the bend, and in its average largest size 9-6000ths of an inch long, with a distance of 2-6000ths inch between the extremities (fig. 18). Size of largest entire specimen $3\frac{1}{4}$ inches long by 2-12ths in transverse diameter; that in which the echinating processes are most developed, 4-12ths inch in diameter.

Hab. Deep sea.

Loc. Atlantic Ocean, between the north coast of Scotland and the Faroe Islands.

Obs. This sponge appears in jars with the Nos. 52, 54, 57, and 27 on them respectively, also in a little bottle with no number. The three former numbers represent stations at which the depth was 384, 363, and 632 fathoms respectively. No. 27 is “Rockall Bank” (lat. $57^{\circ}35'N.$ and long. $13^{\circ}41'E.$)—that is, rocks in the Atlantic, west of the Hebrides and “200 miles from the nearest land,” with only 54 fathoms on them. With the latter is a small *Holtenia*, but nothing else in either of the other jars. The capitate variety (fig. 19) is in jar No. 54 by itself. Besides the general form of this sponge—which

becomes club-shaped at maturity, and the echinating processes overrun and united together by the dermal sarcode into broken ridges or rows (fig. 16, *h*), the surface being formed of a layer of myriads of the little inequianchorates and forceps-like tricurvates (fig. 16, *f*), through which the ends of the skeleton-spicules project, especially towards the ends of the echinating processes—the peculiar form of the inequianchorate, which here and there is in groups like the well-known rosettes of *Esperia ægagropila* &c., and the minute little spicule with bulbous ends which so much resembles a pair of forceps, and must be regarded as a tricurvate, all, together with the single and characteristic form of the skeleton-spicule, point out the alliance of this sponge with *Esperia*, while the echinating processes in form and composition are very much like those of *Cladorhiza abyssicola*, which will be found to be another Esperian sponge. The Esperiadæ come into my 5th division, viz. RAYNERIÆ.

Chondrocladia virgata, Wyv. Thomson. Pl. XIV. figs. 20 & 21, and Pl. XV. fig. 38.

General form a tall, narrow stem, branching scantily and dichotomously, rendered more or less angular by the projection of conical processes arranged alternately round it in a confused spiral manner; each process inflated or jointed in the centre, and surmounted by an attenuated spine-like termination, equal in length to and of the same structure as the conical process. Conical processes and their attenuated spine-like portions diminishing in length towards the ends of the branches, whose stems, thus becoming finally divested of them, present a rounded, naked, *Esperia*-like appearance. Fixed by a spreading root. Colour greenish grey. Surface even, reticulate, composed of dermal sarcode, charged with the flesh-spicules of the species, and pierced by the pointed ends of small linear skeleton-spicules. Pores and vents not seen; probably the former are situated, as usual, in the interstices of the reticular surface of the dermis, and the vents scattered here and there. Internal structure, composed of an axis formed of long skeleton-spicules, arranged parallelly and perpendicularly together, from which radiate transversely bundles of the same kind of spicules to form the "conical processes" &c., imbedded in a parenchymatous sarcode charged with the flesh-spicules of the species, together with the smaller skeleton ones, which project through the surface. Axis and its spicules diminishing in size upwards from the base, where it forms, with the exception of a thin cortical portion, the whole of the stem, intermixed with parenchymatous

structure; permeated by the excretory canal-system, and presenting a distinct spiral arrangement of the spicules. Spicules of two kinds, viz. skeleton- and flesh-spicules. Skeleton-spicule of one form only, viz. smooth, long, linear, slightly curved, fusiform, acute or sub-pinlike, fine-pointed; average largest size 110 by 2-1800ths inch in its greatest diameters (Pl. XV. fig. 38); head narrower than the shaft. Flesh-spicules of two forms, viz. equianchorate and bihamate:—1st. Equianchorate (Pl. XIV. fig. 20): shaft curved, expanded or alate at each end (fig. 20, *a e*), which end is circular (fig. 20, *c e*), and from which rises the falx (fig. 20, *f*), supporting an umbrella-shaped head of seven arms or claws, of which the falx supplies the eighth (fig. 20, *d*), webbed together for half their length, and recurved obliquely towards the centre of the shaft; average largest size 16 by 5-6000ths inch in its greatest diameters, viz. in its total length and breadth of head respectively. 2nd. Bihamate: C-shaped, smooth, more or less contort and sigmoid, rather small; average largest size 6 by $\frac{1}{2}$ -6000th inch in its greatest diameters (fig. 21). Size of entire specimen about 3-12ths inch in diameter at the base, gradually diminishing upwards to a height of 8 to 16 inches (20 to 40 centimetres, Wyv. Thomson, 'Depths of the Sea'). Transverse processes about an inch long, and about 2-12ths inch in diameter at the base.

Hab. Deep sea.

Loc. Atlantic Ocean, between the north coast of Scotland and the Faroe Islands.

Obs. Although there is no number on the jar containing this sponge, the allusion to it in the Report of the 'Porcupine' Expedition for 1869 (Proceed. Roy. Soc. vol. xviii. no. 121, p. 443) shows, by the station ("52") therein mentioned, that it was dredged up here (between the north coast of Scotland and the Faroe Islands) in 384 fathoms. Dr. Wyville Thomson has inserted an excellent figure of it in his 'Depths of the Sea,' p. 188, to which I must refer the reader for an illustration of its general form; but the detail having been left for me to supply, it alone, with illustrations, is herewith given. There were four sponges dredged up on board the 'Porcupine' possessing allied forms of this anchorate, viz.:—that above described; that figured and described by Sars as *Cladorhiza abyssicola* ('Remarkable Forms of Animal Life from the Great Depths of the Norwegian Coast' (Eng.). Published by G. O. Sars. Christiania, 1872, p. 65, pl. vi. figs. 16-34); and another, which I shall hereafter describe and illustrate under the name of *Hali-chondria abyssi*, as far as the two very small fragments that have been preserved of it will permit.

In *Cladorhiza abyssicola*, Sars, the general form is a branched, shrub-like sponge, rising from a thick, solid, *Esperia*-like stem of spicules (that is, a stem very like in appearance to a glass rope, covered by a cortical layer of sarcode in its natural state), in which the branches are very numerous, often anastomosing by contact, and passing into a massive structure; branches echinated with short filamentous processes, and covered generally with a parenchymatous sarcode charged with the flesh-spicules of the species, viz. a small inequianchorate and a very large bihamate, more or less contort, with everted, fine, whip-like ends. Although the skeleton-spicule is similar to that of *Chondrocladia virgata*, Wyv. Thomson, and the anchorate presents one end like the anchorate of this sponge, with alate appendages on the shaft, fully developed (fig. 22), the whole at the other end is aborted, so as to demand for it the term "inequianchorate" (fig. 22, c); while the bihamate, on the other hand, far exceeds in size that of *Chondrocladia*, being 37 by 1-6000th inch in its greatest diameters. I have figured the inequianchorate (Pl. XIV. fig. 22) for comparison, on the same scale, with the equianchorate of *Chondrocladia* (fig. 20) and that of *Halichondria abyssi* (fig. 27), to be described hereafter; but the bihamate is so large that I have not room for the figure of this spicule in this plate. (It seems to me that, in sponges possessing both the anchorate and bihamate flesh-spicules, the larger size of one is always accompanied by a lesser size of the other.) Besides these differences, the opaque cream-yellow colour of *Cladorhiza abyssicola* contrasts strongly with the translucent, greenish-grey one of *Chondrocladia virgata*.

The branched sponge named by Dr. Gray "*Axos Cliftonii*" ("Notes on Arrangement of Sponges," Proc. Zool. Soc. 1867, p. 546), from Nichol Bay, West Australia, must be very like *Chondrocladia virgata*, as the following extract from a note, with rough sketch, kindly handed over to me by Dr. Gray, shows, wherein it is stated to have been "found growing on a piece of rock about a foot square, in 27 branches, 2 feet long." In *Axos Cliftonii* the short, triangular, compressed processes on the stem, whose bases respectively rest longitudinally on the latter, are arranged in an aliform manner spirally round the stem—the skeleton-spicule, of which there is only one form, being acute, and not fusiform, and the flesh-spicule, of which also there is only one form, being like a *Maltese cross*, with six arms, two of which are in a line perpendicular to the plane of the "cross," but so densely charging the parenchymatous sarcode which imbeds the bundles of skeleton-spicules forming the axis, that, altogether, we cannot help seeing in *Axos Clif-*

tonii a great resemblance in every way to *Chondrocladia virgata*.

The single and peculiar form of the skeleton-spicule in *Cladorhiza* and *Chondrocladia*, with the anchorate and bihamate, point to a strong alliance with *Esperia*, Carter, at the same time that their rigid stems, composed of closely united parallel spicules (in *Cladorhiza* anastomosing also) present a strong resemblance to the characteristic fibre-skeleton of *Esperia*.

Histoderma appendiculatum, n. gen. et sp. Pl. XIV.

figs. 23-25 and Pl. XV. fig. 39, a, b.

General form subglobular, smooth, furnished with several narrow tubular prolongations of different lengths, some of which are longer than the diameter of the body (Pl. XIV. fig. 23). Free. Colour light grey. Composed of a stiff glistening bladder-like dermis (fig. 23, a), which also forms the walls of the tubuli (fig. 23, b), and encloses throughout a soft fibreless parenchyma. Dermis a woven-like texture, consisting of a dense layer of linear spicules intercrossing each other on the same plane, and held together by tough horny sarcodae extending into the tubular prolongations, whose cylindrical walls respectively are similarly constructed, and, like the body, retain their form when dry and emptied of their contents. Tubuli terminating abruptly, each followed by a small conical eminence (fig. 23, c) which appears to have had the power of opening and closing itself as required. Pores and vents not distinctly seen, but probably situated at the extremities of the tubuli respectively, which, with the exception of one instance (fig. 23, c), from which the above description is taken, are all broken off. Internal structure massive, fibreless, charged with the spicules of the species and permeated by the excretory canal-systems, which appear to have had their vents respectively at the ends of the tubuli. Spicules of two kinds, viz. skeleton- and flesh-spicules. Skeleton-spicules of two forms, viz.:—one, the largest, smooth, slightly curved, acute, abruptly pointed, average largest size 64 by 1-1800th of an inch in its greatest diameters (Pl. XV. fig. 39, a); the smaller one smooth, slightly curved, fusiform, terminating at each extremity in a constricted neck, followed by a remarkably large elliptical pointed inflation, average largest size about 40 by $\frac{1}{2}$ -1800th inch, inflated ends wider than the shaft (fig. 39, b). Flesh-spicules also of two forms, viz. bihamate and equianchorate. Bihamate (Pl. XIV.

fig. 25) smooth, C-shaped, more or less contort and sigmoid; average largest size about 21 by $1\frac{3}{4}$ -6000th inch. Equi-anchorate (fig. 24, *a, b*) consisting of a simple shaft with three linear arms at each end, united to the former respectively by a short falx. Size of entire specimen about $\frac{1}{2}$ inch in diameter. Longest tube 1-12th inch in diameter and 9-12ths of an inch in length.

Hab. Deep sea.

Loc. Atlantic Ocean off the west coast of Ireland.

Obs. There are specimens of this sponge in two jars, numbered respectively "2" and "24" (*i. e.* Stations), which would give respectively the depths of 808 and 109 fathoms. In jar No. "2" it is in company with *Tisiphonia agariciformis*, Wy. Thomson, *Pachastrella abyssi*, Schmidt, *Tethya cranium*, *Hymedesmia Johnsoni*, Bk., *Halichondria ventilabrum*, *Geodia*, and deciduous fragments of a *Corallistes*; while in jar No. "24" it is in company only with *Hyalonema longissimum*, Sars (*op. cit.*), and *Tisiphonia agariciformis*.

There is a great resemblance in form and structure between this sponge and *Melonanchora elliptica*, inasmuch as both have the same silvery resilient dermal covering filled internally with soft, pulpy, fibreless parenchyma; but while in the latter the dermal structure is only extended to the base of the short tubercles with cribriform heads respectively, in the former, or *Histoderma*, it is extended into the walls of the tubes throughout, terminating abruptly, and followed by the cone of spicules above mentioned, of which unfortunately there is only one example left, the rest of the tubes having been broken off towards their ends.

With, therefore, no fibrous structure internally, it is evident that the bladder-like dermis is the skeleton or organ of support in these sponges.

In some specimens the tubes are shorter than in others; while in others there is nothing but a slight elevation of the surface surrounding a flat or sunken pore-area, but not formed of cribriform sarcode like that of the tubercles in *Melonanchora*.

When dried the specimens present an asbestine appearance from the densely packed spicules of the dermis, which, together with the stiff, horny sarcode that holds them together, forms a textile fabric that retains its form whether wet or dry.

[To be continued.]